## REMARKS/ARGUMENTS

### Withdrawal of Restriction Requirement

Withdrawal of the former restriction requirement in paragraph 1 of the Detailed Action is noted.

### Objection to Claim 12

In paragraph 2 of the Detailed Action, claim 12 has been objected to because of vagueness of the term "high" in the context of the claim. Claim 12 has been amended and the objected-to term no longer appears in the claim.

### Claim Amendments

Claims 1, 2, 5, 7, 8, 10-15, 19 and 20 have been amended, claims 6, 16-18 and 21-23 have been canceled, and claims 26-29 are new. The remaining claims are unchanged.

### Rejection of Claims Under 35 U.S.C. 103(a)

Claims 1-25 stand rejected as being unpatentable over several combinations of prior art including Persson et al. U.S. Patent 3,590,739 ("Persson") in view of Manzara et al. U.S. Patent 5,681,904 ("Manzara"), Persson and Manzara further in view of Woodall et al. U.S. Patent 6,694,886 ("Woodall"), applied to claim 6, Persson and Manzara further in view of Prior et al. U.S. Patent 3,730,096 ("Prior"), applied to claim 13, and Woodall in view of Manzara, applied to claims 14-25.

The various stated grounds of rejection are respectfully traversed for the reasons set forth below and in view of the amendments to the claims. The following discussion is keyed to paragraph numbers ("Para.") of the Detailed Action.

Para. 4. *Claims 1 and 7* have been rejected over Persson as disclosing a signal transmission tube (column 2, lines 33-42) comprising a reactive material, e.g., a "liquid explosive" (column 2, lines 61-62) disposed within a confinement tube. The Examiner states that the "reactive polymeric [sic] material" is configured to leave a portion of the interior of the tube unoccupied as illustrated in Figures 4 through 9. The Examiner acknowledges that Persson fails to teach that the reactive material is a polymeric material.

In order to remedy the acknowledged deficiency of Persson, Manzara is cited as teaching use of a polymer as a base for an energetic material (column 3, lines 34-50).

The Examiner concludes that it would have been obvious to one of ordinary skill in the art at the time of Applicants' invention[1] to utilize any of various reactive materials on the interior of the Persson tube, including a polymer-based reactive material such as described by Manzara. However, as amended herein, claims 1 and 7 respectively define a method and an article in which a solid elongate rod comprised of a reactive polymeric material is disposed within a confinement tube, with the rod being configured to leave a continuous, longitudinally extending, unoccupied portion of the tube interior.

<u>Para. 5.</u> With respect to *claims 2 and 8*, these claims are dependent from, respectively, claims 1 and 7, each of which requires a confinement tube disposed over a solid elongate rod of reactive polymeric material. Persson either alone or in combination with Manzara, fails to show or suggest such structure or method.

<u>Para. 6.</u> With respect to claims *3 and 9*, the same comments apply here as applied to claims 2 and 8. The art relied upon is entirely lacking with respect to a solid polymeric rod enclosed within a confinement tube and leaving the longitudinally extending and continuous open portion.

<u>Para. 7.</u> *Claim 25* is ultimately dependent from independent claim 14 which defines a method for making a signal transmission tube which tube consists of a reactive polymeric material. The combination of Persson and Manzara fails to show or suggest a signal transmission tube which consists of a reactive polymeric material.

<u>Paras. 8 and 9.</u> *Claim 5* defines a method of applying the reactive polymeric material in the form of a paint to the inner wall of the confinement tube. As described in more detail below, Persson discloses only the application of an explosive to the inner surfaces of an inert tube. Persson's reference to a liquid explosive is understood by those skilled in the art as the genesis of the Persson invention. That pioneering invention resulted from the interior wall of a plastic tube being coated with nitroglycerin which hardened to form an explosive coating on the interior wall of the tube. There is no suggestion in Persson of utilizing a reactive polymeric material which exhibits only burning characteristics and not explosive characteristics. See the detailed discussion below of the Manzara reference. Persson discloses only an inert rod in Figure 8 and not a rod made of a reactive polymeric material.

<u>Para. 9.</u> *Claim 10* defines the product of the method of claim 5. The same comments apply here as given above with respect to claim 5.

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[1] For economy of expression, reference below to "obvious" means obvious to one skilled in the art at the time of Applicants' invention.

Para. 10. *Claim 11* specifies a GAP material as the reactive polymeric material of claim 11. The art does not show the use of GAP material in a signal transmission tube.

Para. 11. With respect to *claim 12*, it has been amended (to overcome the objection to the term "high") to define that the polymeric rod has one or more radially extending portions which act as spacers between the rod and the sheath, to define the continuous, longitudinally extending, unoccupied portion between the rod and the confinement tube. The Examiner's statement to the contrary notwithstanding, Persson does not disclose a solid rod of reactive polymeric material. Figures 4 through 9 of Persson (along with other figures of the reference, reproduced between Para. 28 and Para. 29 of the Detailed Action) merely show different cross sections of the inert fuse, on which a pulverulent (or liquid) coating of reactive material is disposed. In all but Figure 8, the cross sections are attained by extrusion of the inert tube material, e.g., an elastomeric polymer. Figure 8 shows a separate, Y-shaped member inserted within the tube, but it, too, is comprised only of an inert material and serves only as a surface on which a pulverulent or liquid explosive may be deposited. At column 2, lines 30-32 of Persson, describing "cross-sectional views of various embodiments of the *fuse wrapping*, partly with elements inserted thereinto." (Emphasis added.) Starting at column 3, line 44, Persson describes Figures 4 through 9 in more detail, these descriptions describe the cross-sectional shapes as being of inert material and include the statements such as "The layer of explosive may be applied onto the insert element prior to its insertion into the tube 10." (with reference to Figure 8) and with reference to Figure 9 that "the fuse wrapping 42 is provided with four longitudinal channels 44 separated from one another and on their inner surfaces carrying thin layers of explosive."

Note that Persson, like Manzara and Woodall, is concerned with and discloses only explosives, not reactive polymeric materials. The distinction is significant, as discussed below in Paras. 14 and 15 and Paras. 16 and 17.

Paras. 12 and 13. *Claim 6* has been canceled.

Paras. 14 and 15. *Claim 13* has been rejected over the combination of Persson and Manzara as applied to claim 12 and further in view of Prior. As the Examiner states in Para. 15 of the Detailed Action, Prior is cited as teaching a fuse with an outer thermal plastic tube and an inner "rod" comprised of a reactive material 3 having a central longitudinal bore 1. As discussed in more detail below, Prior discloses a detonating cord (although Prior uses the terminology "detonating fuse", in which a core of high explosive is enclosed by a casing or sheath. Detonating cord when initi-

ated explodes radially as well as longitudinally along its length. Applicants' claims define a reactive polymeric material which is not a high explosive as disclosed in Prior. Reactive polymeric materials, in particular, GAP materials, are not high explosives. Manzara discloses GAP materials attained by reacting an azido polymer with at least one multi-functional dipolarophile having one or more specified reactive groups. See the abstract, which also refers to "a method of improving the burn rate of an azido polymer...". Starting at column 10, line 1, Manzara describes the burning behavior of the polymer materials including various examples at the succeeding portions of Manzara providing Tables in which the burning behavior of various compositions of the GAP material are recorded. See Examples 1 through 6 and their results tabulated in Tables 1 through 6, ending at column 14, line 43.

GAP polymeric material is reactive in the sense that once ignited it will maintain a burning rate, thereby making it suitable for uses in fuses associated with initiating explosives or other devices. It is not, however, a high explosive such as the high explosive of Prior (and Woodall).

Like Woodall, Prior requires a high explosive within the sheath of his "detonating fuse". See column 1, lines 3-6. Prior serves to increase the detonation velocity providing a hollow bore extending through the high explosive core of the fuse. It may be noted in passing that such high explosive-containing fuse, e.g., detonating cord, is sometimes used to transmit an explosive signal when the radial output explosive force will not affect integrity of the shot. That is, the fuse crosses other fuses or passes through an explosive prior to reaching a detonator which is to be initiated by the fuse, the radially outward explosive force may sever other fuses and/or cause premature explosion thereby foiling the carefully planned timing of a sequence of explosions.

The Examiner states that Persson fails to explicitly disclose that the rod comprises a longitudinal bore therethrough. Persson does not disclose a rod of reactive polymeric material as described above, but only an inert insert such as member 40 illustrated in Figure 8 of Persson. It is to be noted that at column 3, lines 64-67, Persson states that the illustrated embodiments all provide that "the wrapping includes one or several gas channels extending uninterrupted in the longitudinal direction of the fuse."

<u>Paras. 16 through 18.</u> *Claims 14-25* stand rejected over Woodall in view of Manzara. Claims 16-18 and 21-23 have been canceled, and so the following discussion pertains to claims 14, 15 19, 20, 24 and 25.

Woodall, like Prior, is concerned with detonating cord in which a core of high explosive material is encased within a sheath of tubular form. The Examiner contends that it would be obvious in view of Manzara to substitute a polymer-based energetic material for the high explosive of Woodall.

Woodall, like all detonating cord, requires a high explosive core to be effective. As disclosed in Woodall, it is the radially outwardly extending explosive energy that fractures the caked fly ash or hardened scale 9 to remove it from the boiler tubes H. The reactive polymeric material which simply carries a signal longitudinally of the tube without expending energy radially outwardly of the tube would be useless for the application of the Woodall device. At column 1, lines 9-14, Woodall discloses that the reactive cords of his invention are sufficiently rigid for insertion through a material to be fractured by the cords. Starting at column 1, line 66 through column 3, line 3, the prior art technique of boring or pushing holes through caked fly ash in order to thread detonating cord therethrough is described. Under the heading Summary of the Invention, starting at column 4, line 6, Woodall describes detonating cord that is sufficiently rigid so that a six-foot length of the cord may itself be pushed through fly ash to perforate it. Obviously, a reactive polymeric material inside the cord would not avail and a high explosive such as PETN or RDX is utilized. See, for example, column 10, lines 56-68 of Woodall. Therefore, it is respectfully submitted that one skilled in the art would not look to the high explosive structure of detonating cord as explicated in Woodall, for a signal transmission tube.

With respect to *claims 14 and 15*, the art does not show or suggest a method for making an unsheathed fuse consisting of the extruded reactive polymeric material (claim 14) or consisting of the extruded reactive polymeric material having one or more pulverulent reactive materials blended therein.

<u>Paras. 19 through 21.</u> Claims 16-18 have been canceled.

<u>Para. 22.</u> *Claim 19* stands rejected over the combination of Woodall and Manzara. Claim 19 has been amended to define the signal transmission tube as consisting of a reactive polymeric material. The same comments apply here as applied with respect to the above discussion (for Paras. 16 through 18) concerning claims 14 and 15.

<u>Para. 23.</u> *Claim 20* defines the signal transmission fuse as consisting of the reactive polymeric material having one or more pulverulent reactive materials therein. The art relied upon does not show such (unsheathed) structure.

<u>Paras. 24 through 26.</u> *Claims 21-23* have been canceled.

Para. 27. With respect to *claim 24*, utilization of a GAP material in the detonating cord of Woodall would render the detonating cord inoperative, indeed, it would no longer be a detonating cord and would be entirely unsuited for the purpose taught by Woodall.

Para. 28. As to *claim 25*, the same comments apply here as applied to claim 24.

**New Claims 26-29**

Independent new claims 26 and 27 define a method for making a signal transmission tube including extruding a sheath over a reactive polymeric tube with the sheath being configured to be fractured (claim 26) or consumed (claim 27) by reaction of the reactive material. Dependent new claims 28 and 29 have been added to define specific GAP materials.

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In view of the foregoing, allowance of each of the amended claims remaining in the application is respectfully requested.

Respectfully submitted,

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